EXPERIMENTAL WORK ON BRAIN PRESSURE FOLLOWING INJURY.*

Done under the direction of William N. Bullard, M.D.

The experiments were performed at the Physiological Laboratory of the Harvard Medical School through the kindness of Professor H. P. Bowditch. The method employed has been to screw into a trephine hole in the skull a cylinder, into which is slipped another cylinder closed at the end next the brain with a thin rubber membrane and connected at the other end with a tube. This inner cylinder and the tube are filled with water, and the tube can be raised and lowered so as to keep the rubber membrane level, thus holding the brain in normal position.

The uninjured brain of an etherized cat will bulge through an opening left after removal of dura and bone, unless pressure is applied to keep it in place. The pressure necessary to prevent bulging varied in a typical case from 8 cm. to 16.9 cm. of water, according to the degree of etherization. The more ether given, the greater is the pressure until the anesthetic is pushed too far, when the pressure begins to fall. In the case mentioned, the average pressure during five hours of observation was 13 cm. of water. Every factor increasing general blood pressure has an instant effect on brain pressure. A cry (raising thoracic pressure), any general muscular movement, stimulation of the sciatic nerve, the giving of ether (increasing heart action), all demand a stronger pressure to keep the brain level.

Pulsations of the brain are much more extensive after hemorrhage, that is, the brain surface passes through wider excursions with the heart beat and the respiratory changes. Also after hemorrhage the pressure necessary to keep the brain from bulging is less, ranging in one case of considerable bleeding from 1.3 cm. to 4.7 cm. of water, with an average pressure during two and a half hours of 3 cm. of water.

After heavy blows on the skull the pressure needed to prevent the brain from bulging is greatly increased. In one typical case the limits were from 10.1 cm. to 47 cm. of water according to the etherizing, the average pressure during four hours being 27 cm. of water.

---

*Prepared for the twenty-sixth annual meeting of the American Neurological Association, held in Washington, May, 1900.

Experiments thus far fail to show that there is any increase of general arterial pressure to account for the greater brain pressure after injury. No observations have, as yet, been made to ascertain if the increase is to any degree dependent on increased cerebral *venous* pressure.

These observations have confirmed those of Kramer, Polis, and Horsley, that the respiratory center is the first to be affected after a blow on the head. Many times when respiration has ceased artificial respiration for a few minutes has been followed by normal breathing which has continued for hours.

---

124 "LA TOLERANCE DES BROMURES CHEZ LES EPILEPTIQUES AGES" (Tolerance of Elderly Epileptics to Bromides). Féré (Revue de Méd., Jan. 10, 1900).

Féré in this article states that potassium bromide is an anesthetic and amyosthenic, and lowers vascular and nervous tension, diminishing the epileptogenic activity of the cortex and excito-motor power of the bulbo-medullary tract. If the other bromides are given in immediate high doses the same symptoms are produced. Individual tolerance varies extremely. A daily dose of 45 to 60 grains is enough to begin with. Bromic intoxication may readily supervene in organic disease of the heart. When used steadily, the drug tends to accumulate particularly in the brain and liver, but is found to some extent in all tissues. While in theory aged epileptics ought to show diminished tolerance to bromides, the reverse appears to be the case in many instances. Elderly epileptics are not uncommon, and with them the disease may have dated from childhood or developed only in late life. Senile epilepsy proper is due to various causes, alcoholism, moral shock, cerebral diseases, especially to arteriosclerosis. When due to this latter cause we may expect to find insomnia, vertigo, pre-cordial anxiety, etc., with intolerance to bromides. These patients may derive no benefit from bromides, and this condition forms a distinct contra-indication. It often happens, however, that elderly epileptics respond to small doses of bromides, from which they derive much benefit, attacks having been suspended by 4 or 5 gms. within a very short time. Others resist the effect of the bromides, exhibiting a tolerance, and this is the class which we wish to consider. No distinction is made between inveterate and recent senile epilepsy. Féré gives histories of ten cases of senile epilepsy treated successfully by bromides. This author regards it as important to determine the tolerance of bromides in every patient by a slow, gradual increase of the drug; intestinal and cutaneous antisepsis greatly favor tolerance. Contrary to most authorities, Féré thinks that most adjuvants to the bromides provoke intolerance more readily than the latter. CLARK.